CYPRESS SEMICONDUCTOR

CYPRESS SEMICONDUCTOR INVENTION DISCLOSURE FORM

DISCLOSURE NO. IC99001

1. INVENTOR(S)

A. Name __I-Teh Sha__ Initials _____ Empl. No. ▮▮ Ext. No. ▮▮

Citizenship __Taiwan__ Dept # _____ Home Phone No. ▮▮

Home Mailing Address __1901. Halford Ave. Apt #100 Santa Clara, CA 95051__

B. Name __Kuang-Yu Chen__ Initials ▮▮ Empl. No. __9125__ Ext. No. __1115__

Citizenship __USA__ Dept # _____ Home Phone No. ▮▮

Home Mailing Address __20489 Chalet Lane, Saratoga, CA 95070__

C. Name __Albert Chen__ Initials ▮▮ Empl. No. ▮▮ Ext. No. ▮▮

Citizenship __Taiwan__ Dept # _____ Home Phone No. ▮▮

Home Mailing Address __13901 River Ranch Circle, saratoga, CA 95070__

D. Name _____ Initials _____ Empl. No. _____ Ext. No. _____

Citizenship _____ Dept # _____ Home Phone No. _____

Home Mailing Address _____

2. TITLE OF INVENTION: DECREASING PLL OVERSHOOT OR DURING A FOR SPREAD SPECTRUM TRANSITION

3. CONCEPTION OF INVENTION

A. Date of first drawing or drawings ▮▮

Where can first drawing be found? Engineering notebooks

B. Date of first written description ▮▮

Where can description be found? Engineering notebooks

C. Date of first oral disclosure to others ▮▮

To whom ? Kuang-Yu Chen

Inventor(s) _____ Date __7/30/99__

Inventor(s) _____ Date __7/30/99__

Inventor(s) ____Albert Chen____ Date __7/30/99__

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4. CONSTRUCTION OF DEVICE

    A. Date completed _____

    B. Was prototype made? _____

    C. By whom made? _____

    D. Were can the prototype be found? _____

5. TEST OF DEVICE

    A. Date: ████████████   Witness(es):   Kuang-Yu Chen

    B. Results: _____ *Successful* _____

6. SALE

    A. Was invention sold or offered for sale? Yes _____ No ___X___

    B. Was invention used to make, assemble or test a commercial product? Yes ___X___ No _____

    C. Will invention be sold, offered for sale, sampled, or used to make, assemble or test a commercial product?
    Yes ___X___ No _____

    D. Actual or estimated date of first sale, offer or commercial use _____

    E. Is invention part of a product for which there is a data sheet? Yes ___X___ No _____ (if yes,
    attach a copy of the data sheet)

    F. Actual or estimated date of publication, release or availability of data sheet ___ *November 1998* ___

7. USE

    A. Is invention presently being used? Yes ___X___ No _____

    B. Are there specific plans for its use in near future? In what products or processes?

    _____ *The which invention has been implemented in the* ████████ *family* _____

8. RELATED PUBLICATIONS, PATENTS, AND PATENT APPLICATIONS

_____

_____

9. WAS INVENTION: Conceived (Yes _X_ (No ____ Constructed (Yes _X_ (No ____ Tested (Yes _X_
(No ____ during performance of Government Contract?

Inventor(s) _____ *signature* _____   Date _ 7/30/99 _

Inventor(s) _____ *signature* _____   Date _ 7/30/99 _

Inventor(s) _____ *Albert Chen* _____   Date _ 7/30/99 _

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Contract Number _____
(Give Full Contract Number)

The description of invention should be written in the inventor's own words and generally should follow the outline given below. Sketches, prints, photos, and other illustrations, as well as memos or reports of any nature in which the invention is referred to, if available, should form a part of this disclosure and reference and be made thereto in the descriptions of the invention's construction and operation.

FOR ANSWERS TO THE FOLLOWING QUESTIONS, USE THE REMAINDER OF SHEET AND THE ATTACHED SHEET(S).

1. General purpose of invention. State in general terms the objects of the invention.

   To decrease the overshoot or undershoot in a PLL's frequency during the turn on or turn off of spread spectrum. This invention solves unpredictable transition period which could cause a CPU to hang when the spread spectrum transitions on or off.

2. Describe old technology, if any, for performing the function of the invention. Provide references, if available.

   This problem has never been solved.

3. Indicated the disadvantages of the old technology.

   No solution has been considered to spread spectrum transition behavior. Most of time, the transition happens unpredictably. Now it is controllable by programming and circuitry

4. Describe your invention and its construction, showing the changes, additions and improvements over the old method.

Inventor(s) _____ Date 7/30/99

Inventor(s) _____ Date 7/30/99

Inventor(s) _____Albert Chun_____ Date 7/30/99

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1. Schematic

OLD

NEW

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Inventor(s) _____Albert Chen_____ Date 7/30/99

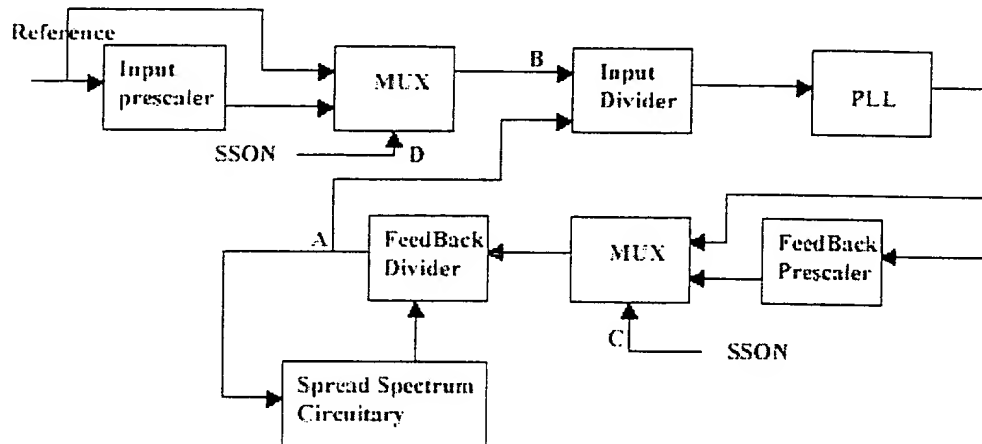Witnessed, Read, and Understood by: _____ Date _____

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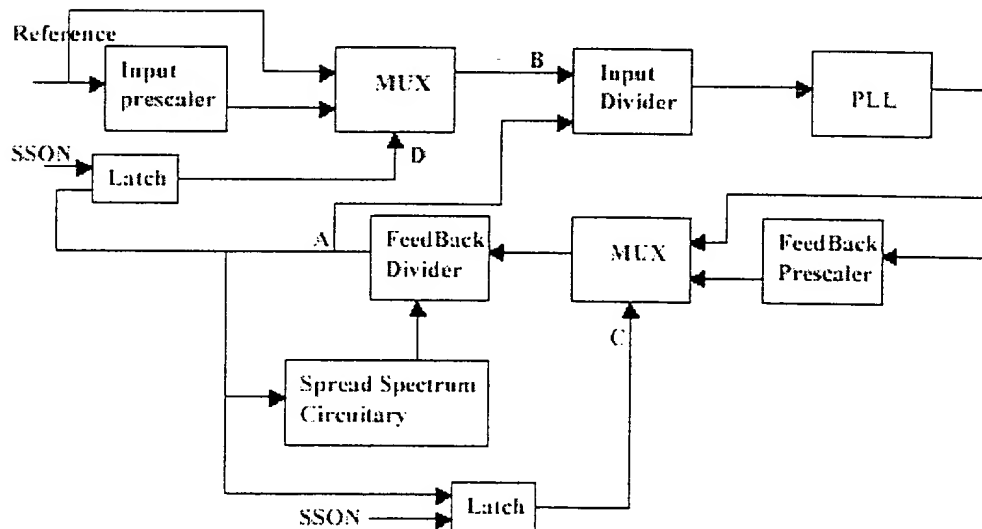
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2. Timing Diagram

OLD

SSON

A

B

C

D

NEW

SSON

A

B

C

D

Inventor(s) _____ Date _7/3c/99_

Inventor(s) _____ Date _7/30/99_

Inventor(s) ___Albert chen___ Date _7/3c/99_
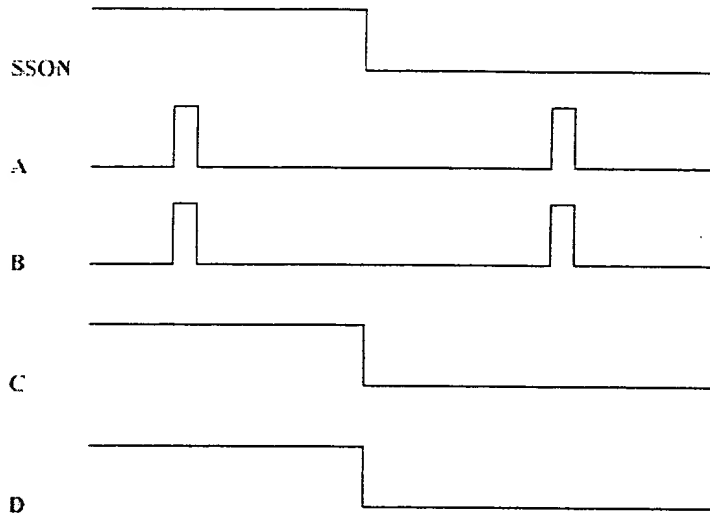
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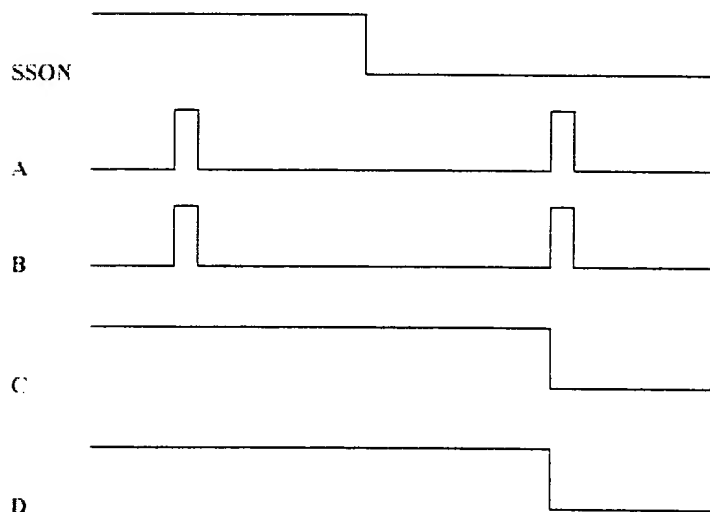
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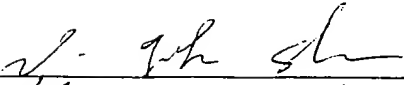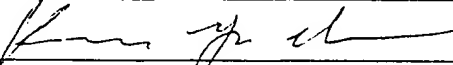## CYPRESS SEMICONDUCTOR INVENTION DISCLOSURE FORM

3. Formula

A. Using the following formula to generate Spread Spectrum ROM code

$$
\begin{bmatrix} X_1(N+1) \\ X_2(N+1) \\ X_4(N+1) \end{bmatrix} = \begin{bmatrix} 0 & -\dfrac{ICO}{FBD(N+1)} & 0 \\ \dfrac{CP}{C_i} & -\dfrac{1}{C_i \cdot R_i} & -\dfrac{1}{C_i \cdot R_i} \\ 0 & \dfrac{1}{C_2 \cdot R_i} & \dfrac{1}{C_2 \cdot R_i} \end{bmatrix} \begin{bmatrix} X_1(N) \\ X_2(N) \\ X_4(N) \end{bmatrix} * \Delta t(N) + \begin{bmatrix} U_1(N+1) \\ U_4(N+1) \\ U_4(N+1) \end{bmatrix} * \Delta t(N) + \begin{bmatrix} X_1(N) \\ X_3(N) \\ X_4(N) \end{bmatrix}
$$

R_1=40 k at SSCG off
R_2=24 k at SSCG on
$U_1(N)$ is changed when SSCG switches OFF-ON or ON-OFF

B. Input FBD(N) to PLL's transient program that optimize the FBD(N) order in ROM address.

C. ▬▬▬▬▬

Inventor(s) _[signature]_	Date 7/30/99		
Inventor(s) _[signature]_	Date 7/30/99		
Inventor(s) _Albert Chen_	Date 7/30/99		
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4.

```
┌──────────────────┐                        ┌──────────────────┐
│ Initialize PLL at│                        │ PLL starts SS ON │
│ VCC Ramping      │                        │ transient        │
└──────────────────┘                        └──────────────────┘
         │                                            │
         ▼                                            ▼
┌──────────────────┐                        ┌──────────────────┐
│ Stabilize PLL    │                        │ PLL gets to the  │
│ at SS OFF        │                        │ SS steady state  │
└──────────────────┘                        └──────────────────┘
         │                                            │
         ▼                                            ▼
┌──────────────────┐                        ┌──────────────────┐
│ Input SS         │                        │ Turn OFF SS,     │
│ ROM code         │                        │ PLL stays SS ON  │
└──────────────────┘                        └──────────────────┘
         │                                            │
         ▼                                            ▼
┌──────────────────┐                        ┌──────────────────┐
│ Turn on SS, PLL  │──────────────────────▶ │ PLL starts SS    │
│ still in OFF state│                       │ OFF transient    │
└──────────────────┘                        └──────────────────┘
         ▲                                            │
         │                                            ▼
         │                                   ┌──────────────────┐
         │                                   │ SS completely    │
         │                                   │ OFF              │
         │                                   └──────────────────┘
         │                                            │
         │                                            ▼
┌──────────────────┐        Bad              ◇ Transient ◇
│ Shift SS ROM     │◀───────────────────────◇ behavior  ◇
│ code order       │                         ◇           ◇
└──────────────────┘                              │
                                                  │ Good
                                                  ▼
                                         ┌──────────────────┐
                                         │ Finalize SS      │
                                         │ ROM code         │
                                         └──────────────────┘
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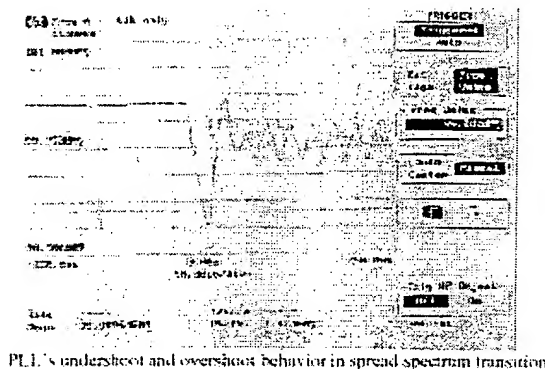Witnessed, Read, and Understood by: _____ Date _____

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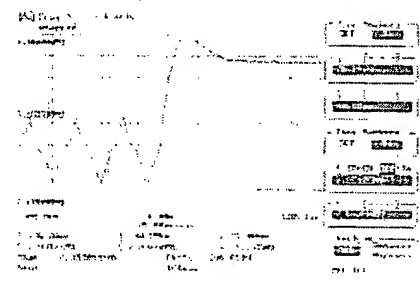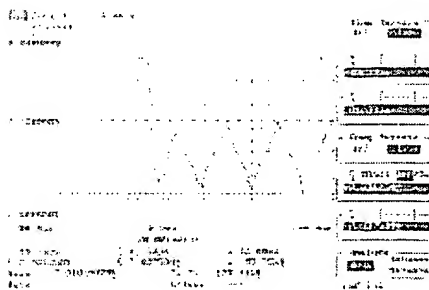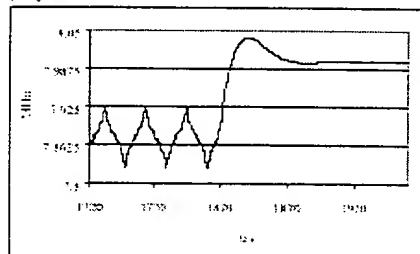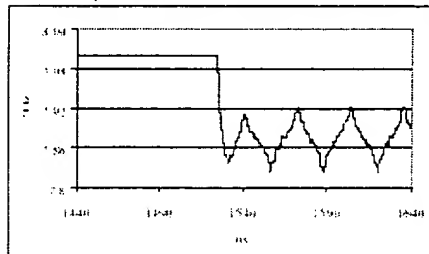(Each page upon which information is entered should be signed and witnessed.)

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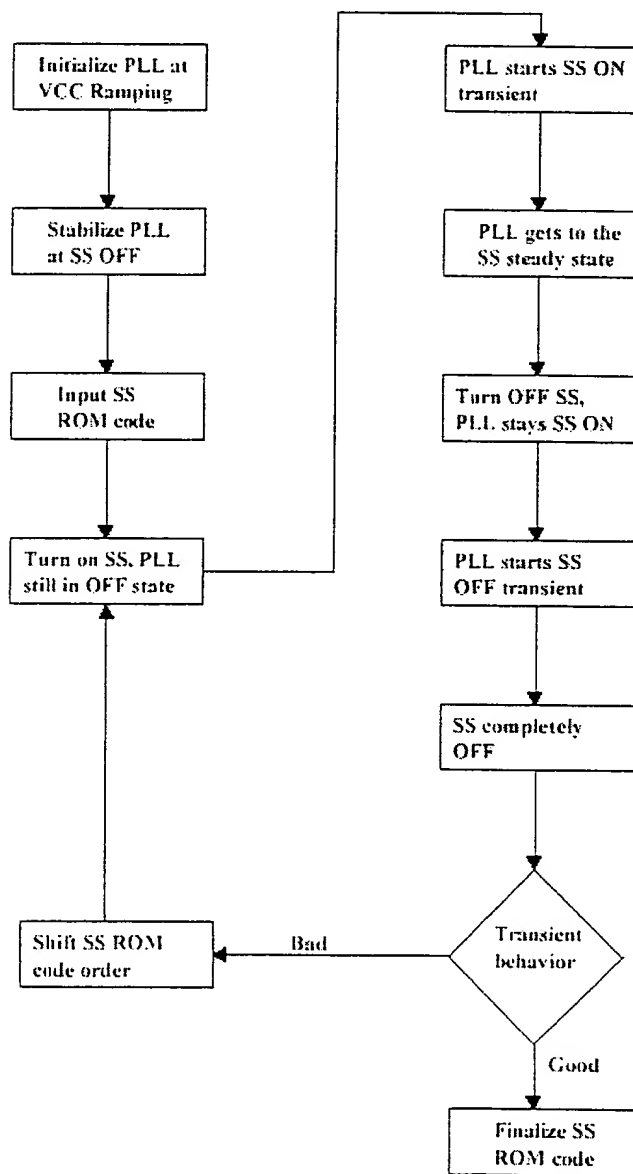
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5. Simulated and measured results

PLL's undershoot and overshoot behavior in spread spectrum transition

Spread Spectrum transition behaviors are controlled by the program

(a) Simulation (b) Measured results in off-on transition   (a) Simulation (b) Measured results in on-off transition

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5. Give details of its operation (i.e., how is your invention used?), if not already described under 4.

6. State the advantages of your invention over what has been done before.

The transient behavior of a spread spectrum can be fully controllable. It prevents PLL's overshoot or undershoot from switching ss on or ss off.

7. Indicated any alternate component(s) and/or method(s) of construction.

8. If a joint invention, indicate what contribution was made by each inventor.

I-Teh Sha   *Implement pll's steady state and transition model*

Kuang-Yu Chen   *The concept of ROM code shifting to improve SSCG's transition behavior*

Albert Chen   *Synchronized circuitry and layout implement.*

9. Describe the features that are believed to be new.

1. FORTRAN program is used to determine transient and steady-state spread spectrum behavior.
2. All dividers and prescalers are synchronized.
3. Transient behavior is simulated starting from steady-state condition

10. State opinion of relative value of invention.

This invention will apply to most of the existing spread spectrum devices. For spread spectrum applications, all EMI reduction chips need to add this invention in order to avoid CPU clock tracking failure during spread spectrum on-off or off-on transition.

11. After the disclosure is prepared, it should be signed by the inventor(s) and then read and signed by two witnesses in the space provided at the bottom of each sheet.

Inventor(s) _____ Date 7/30/99

Inventor(s) _____ Date 7/30/99

Inventor(s) __Albert Chen_____ Date 7/30/99

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